Is my vagina stressed? Bayesian Dirichlet models to investigate the effect of stress on vaginal microbioma in a Spanish cohort

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The vagina is inhabited by numerous microorganisms which constitute the vaginal microbiota. Its composition is dynamic and evolves throughout a woman's life. Previous studies on rodents have shown that stress could play an important role in changes in the vaginal microbiota, by altering cortisol levels which, by inhibiting the deposition of estrogen-dependent substrates, would limit the growth of *Lactobacillus*. Such an imbalance in the vaginal microbial community predisposes women to a higher risk of suffering from sexually transmitted diseases and other gynaecological problems.

However, the examination of these relations presents certain challenges, as microbiota data consists of the proportions of genetic sequences for several hundreds of genus or species. As a result, when analysing this kind of high-dimensional compositional data (CoDa), specifically tailored statistical techniques for dimensionality reduction shall be considered.

In this work, we present the preliminary results of the possible association between vaginal microbiota and stress, quantified as the concentration of cortisol in blood serum and hair on 259 women from INMA (Environment and Childhood) Project. Dirichlet multinomial mixture models were used to reduce the dimensionality of the vaginal data into the probability for each woman to belong to one of few microbiota profiles. The impact of cortisol levels on the microbiome profile, corrected by other biological and socioeconomic variables, is then assessed in a Dirichlet Bayesian regression model.

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